

## CLAIMS

1. A plastid transformation vector suitable for transforming a non-green plant cell, said plastid vector comprising, as operably linked components, a first flanking sequence, a DNA sequence coding for a foreign gene, and a second flanking sequence.  
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2. The vector of Claim 1, further comprising a regulatory sequence functional in said plastid transformation vector.
3. The vector of Claim 2, wherein said regulatory sequence comprises a promoter operative in said plastid genome.
- 10 4. The vector of Claim 3, wherein said promoter is *Prrn 16S* rRNA.
5. The vector of Claim 4, wherein said regulatory sequence comprises *psbA* 5' and *psbA* 3' elements.
6. The vector of Claim 2, wherein said regulatory sequences further comprise a 5' UTR capable of providing transcription and translation enhancement of said DNA sequence coding for a foreign gene.  
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7. The vector of Claim 2, wherein said regulatory sequences further comprise a 3' untranslated region (UTR) capable of conferring transcript stability to said DNA sequence coding for a foreign gene.
8. The vector of Claim 2, wherein said regulatory sequence further  
20 comprise a gene 10 5'UTR.
9. The vector of Claim 8, wherein said regulatory sequence further comprises a gene 10 5'UTR/rps 16 3'UTR.
10. The vector of Claim 1, wherein said first flanking sequence is 16S/*trnI*, and wherein said second flanking sequence is *trnA*/23S.
- 25 11. The vector of claim 1, wherein said first flanking sequence is about 4kb.
12. The vector of claim 1, wherein said second flanking sequence is about 4kb.
13. The vector of Claim 1, wherein the vector is component for stably integrating into a plastid genome of a higher plant species, and wherein said first and  
30 second flanking DNA sequences are substantially homologous to sequences in a spacer region of said plastid genome, and wherein said flanking sequences are conserved in the plastid genome of said higher plant species.

14. The vector of Claim 13, wherein said spacer region is a transcriptionally active spacer region.
15. The vector of Claim 6, wherein said 5' UTR is a 5' UTR of *psbA*.
16. The vector of Claim 7, wherein said 3' UTR is a 3' UTR of *psbA*.
- 5 17. The vector of Claim 1 further comprising a DNA sequence encoding a selectable marker.
18. The vector of Claim 17, wherein said selectable marker is an antibiotic-free selectable marker.
19. The vector of Claim 18, wherein said antibiotic-free selectable marker is  
10 Betaine aldehyde dehydrogenase (BADH).
20. The vector of Claim 17, wherein said DNA sequence encoding said selectable marker encodes an antibiotic resistance selectable marker.
21. The vector of Claim 20, wherein said antibiotic resistance selectable marker is *aadA*.
- 15 22. A plant stably transformed with the vector of Claim 1.
- 23 A progeny of the plant of claim 22.
24. A seed of the plant of claim 22.
25. A non-green part of the plant of claim 22, comprising a plastid genome having a heterologous DNA sequence coding for polypeptide of interest.
- 20 26. The plant of Claim 22, wherein said plant further comprises at least one pro-plastid transformed with the vector of Claim 1.
27. A somatic embryo transformed with the vector of Claim 1.
28. A non-green plant cell comprising a non green plastid including an expression cassette comprising, as operably joined components, a promoter functional  
25 in said non-green plastid, heterologous DNA sequence encoding a polypeptide of interest, at least one additional structural gene or functional portion thereof encoding a polypeptide which confers a selectable trait, wherein transcription of said heterologous DNA sequence is regulated by said promoter, a transcriptional termination region and

plastid DNA flanking sequences flanking said expression cassette to facilitate stable integration of the expression cassette into a genome of said plastid by homologous recombination.

29. The non-green plant cell of Claim 28, capable of regenerating through  
5 somatic embryogenesis.

30. A transgenic non-green plant cell having a plastid genome transformed with the plastid transformation vector of Claim 1, wherein said transgenic non-green plant cell is regenerated through somatic embryogenesis.

31. A method of transforming a plastid through somatic embryogenesis  
10 comprising the steps of:

integrating the vector of Claim 1 into a plastid genome of a plant plastid.

32. A method of achieving plastid transformation using no-green explants, wherein a plant is regenerated through somatic embryogenesis comprising the steps of:

33. A plant cell comprising a plastid including an expression cassette  
15 comprising, as operably joined components, a heterologous DNA sequence encoding a polypeptide of interest, a DNA sequence encoding a selectable marker, and plastid DNA sequences flanking the expression cassette to facilitate stable integration of the said expression cassette into the chloroplast genome by homologous recombination, wherein said plant cell is regenerated through somatic embryogenesis.

20 34. A non-green plant cell capable of regenerating through somatic embryogenesis, wherein said non-green plant cell comprises a heterologous DNA sequence coding for a polypeptide of interest, wherein said heterologous DNA sequence coding for said polypeptide of interest is integrated into a plastid contained in said non-green plant cell.

25 35. A plastid transformation vector capable for transforming non-green plant cells, said plastid vector comprising, as operably linked components, a first flanking sequence, promoter operative in a plastid, a DNA sequence coding for a selectable marker operative in said plastid, a DNA sequence coding for a foreign gene, and a second flanking sequence.

30 36. A plastid transformation vector suitable for transforming a plastid, wherein said plastid to be transformed is in a non-green plant cell, and wherein said plastid transformation vector comprises, as operably linked components, a first

flanking sequence, a regulatory sequence functional in said plastid, a heterologous DNA sequence coding for a polypeptide of interest, and a second flanking sequence.

37. A method for producing a polypeptide of interest in a non-green plant cell, wherein said polypeptide of interest is coded for by a heterologous DNA sequence, comprising the steps of:

integrating a plastid transformation vector according to Claim 1 into the plastid genome of a plant cell; and

growing said plant cell to express said polypeptide of interest.

38. A method of visually selecting a transgenic plant comprising the steps of:

transforming a non-green plant cell via the vector of claim to express an exogenous betain aldehyde dehydrogenase (*badh*) gene.

39. A plastid transformation vector suitable for transforming a non-green plant cell, said plastid vector comprising, as operably linked components, a first flanking sequence, a regulatory sequence functional in a plastid, DNA sequence coding for a foreign gene, and a second flanking sequence.